# THIOUREA

CAS Registry Number: 62-56-6 $H_2NCSNH_2$

Molecular Formula: $CH_4N_2S$

Thiourea occurs in the form of white, shiny crystals. It is soluble in ethanol, and ammonium thiocyanate solution. It is almost insoluble in ether. When heated to decomposition, thiourea emits toxic fumes of nitrogen oxides and sulfur oxides (Merck, 1983; NTP, 1991).

**Physical Properties of Thiourea**

Synonyms: thiocarbamide

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|---|---|
| Molecular Weight: | 76.12 |
| Boiling Point: | 150 - 160 $^oC$ (sublimes) |
| Melting Point: | 176 - 178 $^oC$ |
| Vapor Pressure: | $7.5 \times 10^{-8}$ mm Hg at 20 $^oC$ |
| Density/Specific Gravity: | 1.405 at 25/4 $^oC$ (water = 1) |
| Log Octanol/Water Partition Coefficient: | -1.02 |

(HSDB, 1993; Merck, 1983)

## SOURCES AND EMISSIONS

A. Sources

Thiourea is used in photo-sensitive papers, in boiler-water treatment, and as a chemical intermediate. It is also used as a vulcanization accelerator, as a metal corrosion inhibitor for pickling solutions, in plating baths for metals, in nylon and textile treatments, and in the production of resins (HSDB, 1993).

The primary stationary sources that have reported emissions of thiourea in California are the manufacturers of electronic components and accessories, manufacturers of guided missiles, space vehicles and parts, and manufacturers of aircraft and aircraft parts (ARB, 1997b).

B. Emissions

The total emissions of thiourea from stationary sources in California are estimated to be at least 550 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (ARB, 1997b).

C. Natural Occurrence

Thiourea is found to occur naturally in laburnum shrubs, and as a metabolite of verticillium albo-atrum and bortrylio cinerea (HSDB, 1993).

## AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of thiourea.

## INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of thiourea was found in the readily-available literature.

## ATMOSPHERIC PERSISTENCE

The very low vapor pressure of thiourea suggests adsorption to particulate matter may be a reasonable atmospheric mechanism. Therefore, wet and dry deposition of associated particulates may be a significant atmospheric removal process. The average half-life and lifetime for particles in the atmosphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Atkinson, 1995; Balkanski et al., 1993).

## AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of April 1996, thiourea contributed to a total cancer risk in 1 of the approximately 550 risk assessments reporting a total cancer risk greater than or equal to 1 in 1 million (OEHHA, 1996a).

## HEALTH EFFECTS

Probable routes of human exposure to thiourea are inhalation, ingestion, and dermal contact.

Non-Cancer: Skin sensitivity in the form of eruptions may occur from repeated contact with thiourea. Thiourea may cause toxic effects on the blood system including bone marrow toxicity and reduction in red blood cells, white blood cells, and platelets. Enlargement of the thyroid (goiter) and spleen has also been reported from exposure to thiourea (HSDB, 1995; Sittig, 1991).

The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) or an oral Reference Dose (RfD) for thiourea (U.S. EPA, 1995a).

Cancer: There is evidence from studies in experimental animals that thiourea causes liver and thyroid tumors. The U.S. EPA has classified thiourea in Group B2: Probable human carcinogen (U.S. EPA, 1995a). The International Agency for Research on Cancer has classified thiourea in

Group 2B: Possibly carcinogenic to humans, based upon sufficient evidence in animals and inadequate data in humans (IARC, 1987a).

The State of California has determined under Proposition 65 that thiourea is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is $2.1 \times 10^{-5}$ (microgram per cubic meter)$^{-1}$ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of thiourea is estimated to be no greater than 21 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is $7.2 \times 10^{-2}$ (milligram per kilogram per day)$^{-1}$ (OEHHA, 1994).